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Research Report

COMPARISON OF EFFECTIVENESS OF BEND LEG RAISE TECHNIQUE OF MULLIGAN V/S KNEE TO CHEST TECHNIQUE OF MCKENZIE TO IMPROVE FORWARD FLEXION RANGE IN SUBJECTS WITH HAMSTRING TIGHTNESS WITHIN THE AGE GROUP OF 20-30 YEARS

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ABSTRACT

Aim of Study: To compare the effectiveness of Bend leg raise technique of mulligan versus knee to chest technique of McKenzie in improving forward flexion.

Objectives

1. To find the effect of Bend leg raise technique of mulligan improving forward flexion
2. To find the effect of knee to chest technique of McKenzie improving forward flexion
3. To compare between the effectiveness of Bend leg raise technique and knee to chest technique improving forward flexion.

Conclusion

1. Knee to Chest technique of McKenzie produced a significant improvement in forward flexion after one day intervention period.
2. Bend Leg Raise technique of Mulligan produced a significant improvement in forward flexion after one day intervention period.
3. Both Knee to Chest technique of McKenzie and Bend Leg Raise technique of Mulligan have significant results on the improvement of forward flexion, but on the comparison, Bend Leg Raise technique of Mulligan is proved to be more effective in improving forward flexion than Knee to Chest technique of McKenzie.

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INTRODUCTION

Regular physical activity has been regarded as an important component of a healthy lifestyle and has been proven to increase longevity and the overall quality of life. Flexibility is defined as the absolute range of movement in a joint or series of joints that is attainable in a momentary effort with the help of a therapist or a piece of equipment. Flexibility is the ability to move a single joint or series of joints through an unrestricted painful range of motion (ROM).

Adequate levels of flexibility and skeletal muscles strength the necessary for the execution of efficient movement, which in turn provides a better quality of life and optimal performance in competitive sports¹ and in the contemporary rehabilitation of patients with cardiovascular diseases.³ Therefore there has been increasing interest in the isolated and integrated physiology of flexibility and skeletal muscle performance.

Conscious integration of each element into one's lifestyle is considered a critical ingredient for a healthy and active

individual. Two of these components are: balance and flexibility

Often the term flexibility is used to refer more specifically to the ability of the musculotendinous unit to elongate as a body segment or when joint moves through ROM. Good flexibility provides relaxation, posture eases muscular pain, helping quick recovery, reducing stress, keeps the body feel loose and agile⁴⁻⁶.

Hamstring muscles are the muscles at the back of the thigh comprising the long head of biceps femoris, the semitendinosus and the semimembranosus muscles; hamstring muscles arises from ischial tuberosity act across both hip and knee joints and are innervated by the tibial nerve⁴.

Tight hamstrings are a common complaint not only amongst runners, cyclists and rowers, but for those who tend to sit most of the day, whether at a desk at work or school, spend a lot of time on the couch watching TV, sitting at the computer, even for those individuals who spend hours in the car every day. Other contributing factors for hamstring injury include lack of

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hamstring strength, inadequate warm-up, and muscle fatigue^{9, 12}.

As two-joint muscles, the ability to produce effective force at the knee is influenced by the relative position of the other joint over which that muscle crosses. Greater hamstring force is produced with the hip in flexion when the hamstrings are lengthening over that joint regardless of the knee position¹³. When the two-joint hamstring are required to contract with hip extended and the knee flexed to 90 degree or more, the hamstring must shorten over both the hip and knee. The hamstring will weaken as knee flexion proceed because not only are they approaching maximum shortening capability but also the muscle group must overcome the increasing tension in rectus femoris muscle that is approaching passive insufficiency¹³.

Manual (or manipulative) therapy is an area of specialization that has evolved within the field of physiotherapy. Manual therapy includes many different concepts put forward by innovative practitioners, such as Maitland, McKenzie, Kaltenborn and Mulligan.¹⁴

The Mulligan mobilization techniques like bent leg raise (BLR) technique, tSLR technique and Two Leg Rotation(GATE) Technique has been described as a means of improving range of SLR in subjects with LBP and alleviating radiating or non-radiating pain^{15, 22}.

In 1981, Robin McKenzie proposed a classification system and a classification-based treatment for LBP called McKenzie method.¹⁶

According to this method, the classification of LBP patients is based on patterns of pain response and use assessment techniques to categorize patients into specific clinical subgroups.¹⁷ The core component of treatment in the McKenzie method is exercise, which consists of sustained postures or repeated movements similar to the loading strategies used for the assessment.¹⁸

Aim of Study

To compare the effectiveness of Bend leg raise technique of mulligan versus knee to chest technique of McKenzie in improving forward flexion.

Objectives

- a. To find the effect of Bend leg raise technique of mulligan improving forward flexion
- b. To find the effect of knee to chest technique of McKenzie improving forward flexion
- c. To compare between the effectiveness of Bend leg raise technique and knee to chest technique improving forward flexion.

Need of Study

Decreased hamstring flexibility is a risk factor for the development of patella tendinopathy and patellofemoral pain, hamstring strain injury⁶. Lack of hamstring flexibility was the single most important characteristics of hamstring injuries in athletes⁷. Inadequate muscular flexibility has been cited as one possible cause of hamstring injury^{9, 10, 11}.

It is important to determine which method is more effective in our clinical scenario that would help the physiotherapist to choose the most effective treatment procedure which will help their patients maintain adequate flexibility of muscles.

It is considered that in other stretching techniques, a greater degree of strength than 25% of the available force is used; hence recruitment is occurring of phasic muscle fibres, rather than the postural fibres which are required to get stretched.

Mulligan's techniques vs. McKenzie techniques on restricted SLR to reduce hamstring tightness, increasing flexibility and the risk of developing LBP in these individuals. Hence this study is being conducted.

Among the various stretching techniques, there are very few consensus available on comparison of bend leg raise technique of Mulligan and knee to chest technique of McKenzie improves hamstring flexibility and hence there exists a need for this study to find out the superior form of technique in improvement of hamstring flexibility

METHODOLOGY

Type of study: - Experimental Study

Sample size: - 40 (20 in each group)

Sampling technique: - Simple Random Sampling- Number method

Duration: - 3 months

Tools used: - Goniometer and Measuring tape.

Outcome Measure: - Straight Leg Raise test and Finger to Floor

Test

Inclusion Criteria

1. Asymptomatic subjects aged 20 to 30 years.
2. 20-40 degrees active knee extension loss with hip in 50-degree flexion
3. Stretch end feels during a complete range of motion.
4. Restricted forward flexion

Exclusion Criteria

1. Fractures of the hip and knee.
2. Dislocations of the lower limb.
3. Hamstring injuries.
4. Hypermobility of lower limb joint.
5. Muscle imbalance of lower limb.
6. Nerve lesions of the lower limb.
7. Subjects having low back pain in last 2 month.
8. Straight leg, hip flexion ROM was greater than 100 degrees.
9. Metal pins, plates or screw in the femur.
10. Neurological abnormalities.

Study procedure

40 normal male-female participants within the age group of 20-25 years were recruited for the study after signing an informed consent and were screened for inclusion and exclusion criteria. The participants were randomly assigned to either group A or group B using number method. The group A performed Knee to chest exercise as per McKenzie technique. On group B the Bend Leg Raise technique of Mulligan therapy was performed Measurement of Hamstring length and flexibility was done

using Straight Leg raise and Finger to Floor test^{26, 27} Testing took place in the exercise room at DPO'S Nett College Of Physiotherapy. All tests were assessed on the same day for each student. The participants were allowed to rest for 20 minutes between tests. All measures were performed on the same day. For the evaluation of flexibility of hamstring have been used Goniometer and Finger to Floor test. The measurement of hip flexion with knee straight with Goniometer was tested in a medical bed. The initial and final position of each movement passively measured starting from the anatomical neutral point O, as determined by the American Academy of Orthopedic Surgeons (1965).

Outcome measure

Straight leg raise - This technique is performed as an outcome measure by the subjects so as to test the hamstring flexibility by the active maneuver. The subject lies supine onto the medical bed. Bending the other leg the subject raises the testing leg to the maximum possible range the subject withstands. The therapist measures this range by use of Goniometer using the head of the femur as fulcrum. The same procedure is performed on the other leg. The readings of the measurement are noted by the therapist. This procedure is performed as pre-intervention and post-intervention outcome measure.

Finger to Floor Test-The patient stands comfortably with the feet facing forward and is asked to bend forward. The instruction is, "Without bending your knees, attempt to touch the floor with your fingertips, go only as far as you can." The distance between the patient's right long finger and the floor is measured in centimetres. The readings of the measurement are noted by the therapist. This procedure is performed as pre-intervention and post-intervention outcome measure.

Treatment Technique

BLR: Therapist stands at the limited SLR side of the supine patient. Therapist place the patient's flexed knee over his (therapist's) shoulder and now asks the subject to push the therapist with his leg and then relaxes. At this point, therapist push his (patient's) bent knee up as far as possible can in the direction of his (therapist's) shoulder on the same side provided there is no pain. If it is painful alter the direction by taking patient leg more medially or laterally. Sustain this stretch for five seconds and then lower the leg to the bed. With the bent knee over therapist shoulder includes a traction component with this technique. When indicated the stretch does not hurt and repeated three times.¹⁸

Knee to Chest: This technique is preformed actively by the subject. The subject lies in supine on the medical bed. As per the therapist's instruction the subject is asked to bend the both the legs and touch the knees to the chest as much as possible. This procedure is to be repeated times.

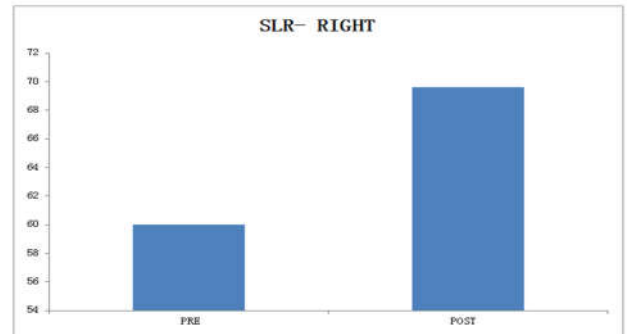
TABLES AND RESULTS

Demographic Data of Group A

Parameters	
No of cases	20
Gender	MALE-10 FEMALE-10
Range of age	20 – 30 YEAR
Mean of age	22 YEARS

Demographic Data of Group B

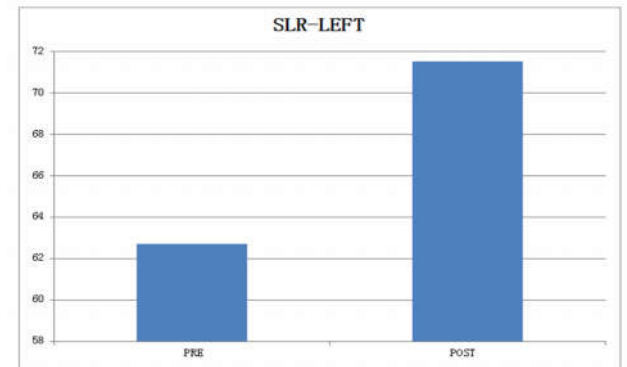
Parameters	
No of cases	20
Gender	MALE-10 FEMALE-10
Range of age	20 – 30 YEAR
Mean of age	22.15 YEARS



Graph 1 Comparison of Pre & Post Test Values of Straight Leg Raise Technique in Group A (Right Leg)

	MEAN	SD	SEM	t-value	Significance
PRE	60.0	6.28	1.40	11.199	Significant
POST	68.96	6.99	1.60		

By Paired t test p <0.0001*



Graph 2 Comparison of Pre & Post Test Values of Straight Leg Raise Technique in Group A (Left Leg)

	MEAN	SD	SEM	t-value	Significance
PRE	62.70	6.10	1.36	12.918	Significant
POST	71.95	6.76	1.55		

By Paired t test p <0.0001*



Graph 3 Comparison of Pre & Post Test Values Of Straight Leg Raise Technique in Group B (Right)

	MEAN	SD	SEM	t-value	Significance
PRE	66.70	4.91	1.10	25.604	Significant
POST	86.89	3.63	0.83		

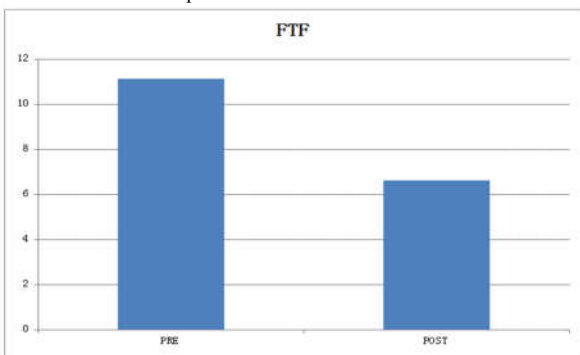
By Paired t test p <0.0001*



Graph 4 Comparison of Pre & Post Test Values of Straight Leg Raise Technique In Group B (Left Leg)

	MEAN	SD	SEM	t-value	Significance
PRE	68.20	6.50	1.45	20.946	Significant
POST	87.21	4.79	1.10		

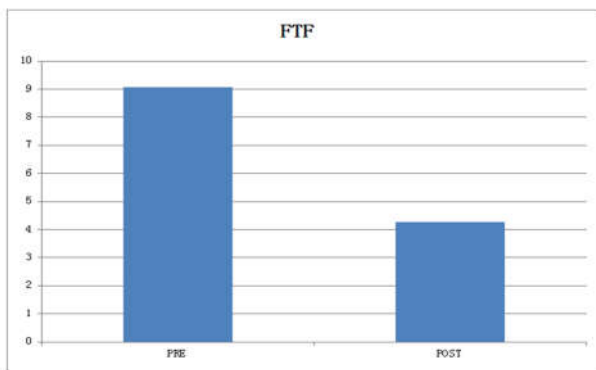
By Paired t test $p < 0.0001^*$



Graph 5 Comparison of Pre & Post Test Values of Finger To Floor Technique In Group A.

	MEAN	SD	SEM	t-value	Significance
PRE	11.10	1.77	0.40	20.124	Significant
POST	6.62	1.76	0.39		

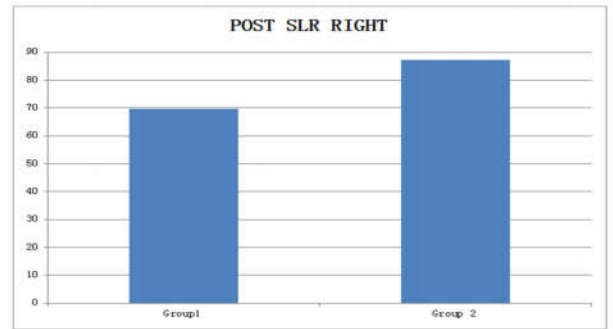
By Paired t test $p < 0.0001^*$



Graph 6 Comparison of Pre & Post Test Values of Finger To Floor Technique In Group B.

	MEAN	SD	SEM	t-value	Significance
PRE	9.05	2.06	0.46	8.529	Significant
POST	4.32	1.29	0.30		

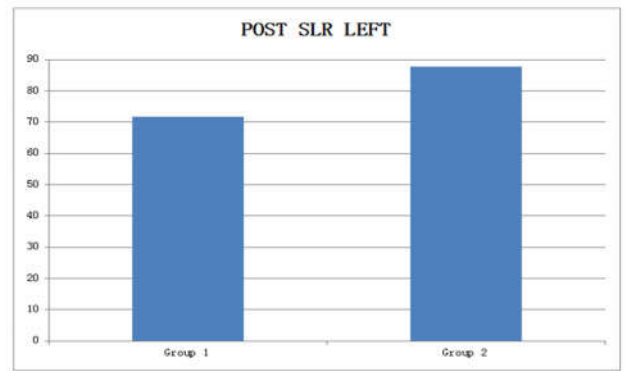
By Paired t test $p < 0.0001^*$



Graph 7 Comparison of Post Test Values Of Straight Leg Raise Technique In Group A And B of Right Leg

	MEAN	SD	SEM	t-value	Significance
PRE	69.60	7.40	1.65	9.174	Significant
POST	86.84	3.59	0.82		

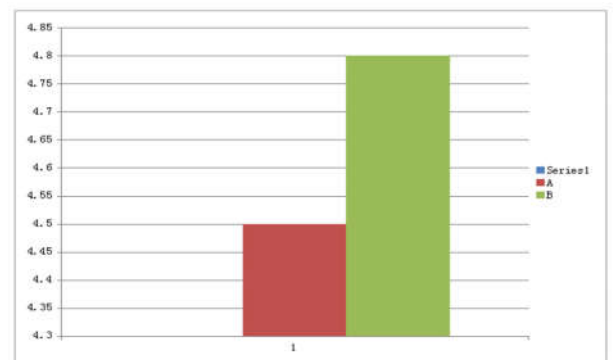
By Unpaired t test $p < 0.0001^*$



Graph 8 Comparison of Post Test Values of Straight Leg Raise Technique In Group A and B of Left Leg

	MEAN	SD	SEM	t-value	Significance
PRE	71.50	6.88	1.59	8.234	Significant
POST	87.21	4.79	1.10		

By Unpaired t test $p < 0.0001^*$



Graph 9 Comparison of Difference Value of Finger To Floor Technique In Group A And B

	MEAN	SD	SEM	t-value	Significance
PRE	4.50	1.00	0.22	1.031	Not significant
POST	4.89	1.37	0.31		

By Unpaired t test $p < 0.0001$

DISCUSSION

The purpose of the study was to determine the effect of BLR technique of Mulligan Sand knee to chest technique of McKenzie on improving forward flexion in healthy subjects. On Group A knee to chest technique has been performed on the medical bed while on Group B BLR technique of McKenzie has been performed. The hamstring length was measured using SLR and Finger to floor test before and immediately after the intervention.

Table 1 shows demographical representation of the subjects (n=20) of Group A

Table 2 shows demographical representation of the subjects (n=20) of Group B

Table 3 shows the comparison of the pre-intervention and post-intervention values of SLR of RT leg in Group A (n=20, t= 11.199, p<0.0001) which was statistically significant. This shows that there was a significant improvement of forward flexion after intervention using Knee to chest technique of McKenzie.

Table 4 shows the comparison of the pre-intervention and post-intervention values of SLR of LEFT leg in Group A (n=20, t= 12.918, p<0.0001) which was statistically significant. This shows that there was significant improvement of forward flexion after intervention using Knee to chest technique of McKenzie

Table 5 shows the comparison of the pre-intervention and post-intervention values of SLR of RT leg in Group B (n=20, t= 25.604, p<0.0001) which was statistically significant. This shows that there was significant improvement of forward flexion after intervention using Bend Leg Raise technique of Mulligan

Table 6 shows the comparison of the pre-intervention and post-intervention values of SLR of LEFT leg in Group B (n=20, t= 20.946, p<0.0001) which was statistically significant. This shows that there was significant improvement of forward flexion after intervention using Bend Leg Raise technique of Mulligan

Table 7 shows the comparison of pre & post test values of the finger to floor technique in group A (n=20, t= 20.124, p<0.0001) which was statistically significant. This shows that there was a significant improvement of forward flexion after intervention using Knee to chest technique of McKenzie.

Table 8 shows the comparison of pre & post test values of finger to floor technique in group B (n=20, t= 8.529, p<0.0001) which was statistically significant. This shows that there was significant improvement of forward flexion after intervention using Bend Leg Raise technique of Mulligan

Table 9 shows the comparison of post-test values of straight leg raise technique of RIGHT leg in group A and B. (n=20, t=9.174, p<0.0001) which was statistically significant. This shows that there was a significant improvement using Bend Leg Raise technique of Mulligan over Knee to Chest of McKenzie.

Table 10 shows the comparison of post-test values of straight leg raise technique of LEFT leg in group A and B. (n=20, t=8.234, p<0.0001) which was statistically significant. This

shows that there was significant improvement using Bend Leg Raise technique of Mulligan over Knee to Chest of McKenzie **Table 11** shows the comparison of difference values of the finger to floor technique in group A and B. (n=20, t=1.0316, p>0.0001) which was statistically not significant. This shows that on comparisons of forward flexion using Finger to Floor test both the techniques were equally efficient.

CONCLUSION

1. Knee to Chest technique of McKenzie produced a significant improvement in forward flexion after one day intervention period.
2. Bend Leg Raise technique of Mulligan produced a significant improvement in forward flexion after one day intervention period.
3. Both Knee to Chest technique of McKenzie and Bend Leg Raise technique of Mulligan have significant results on the improvement of forward flexion, but on comparison, Bend Leg Raise technique of Mulligan is proved to be more effective in improving forward flexion than Knee to Chest technique of McKenzie.

Limitations

1. Small sample size
2. Follow-up was not done to test the long term effects

Suggestion

1. Study needs to be done on larger sample size
2. Effect of the exercise protocol of longer duration needs to be investigated.
3. Effect of the exercise protocols on patient population needs to be studied
4. Pelvic rotation which is part of forward flexion biomechanics can be taken into consideration.

Clinical Implication

This study has shown that although both Knee to Chest technique of McKenzie and Bend Leg Raise technique of Mulligan have significant results on improvement of forward flexion, but on comparison, Bend Leg Raise technique of Mulligan is proved to be more effective in improving forward flexion than Knee to Chest technique of McKenzie

Depending on therapists' and patients' convenience, requirements and availability of materials these techniques of manual therapy can be used effectively as a preventive or therapeutic measure for low back pain, hamstring tightness, any postural alteration related to muscle tightness.

Summary

The study was conducted on a sample size of 40 healthy females and males in the age group of 20-30 yrs divided randomly into two groups-Group A performing Knee to chest technique of McKenzie and Group B performing Bend leg raise technique of Mulligan, the effect of which was measured using Straight Leg raise and Finger To Floor test before and immediately after an intervention period of a day.

The results have shown that both groups have demonstrated a statistically significant improvement, but in comparison, Bend Leg raise technique of Mulligan was found to be more effective than Knee to the chest of McKenzie.

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